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ABSTRACT

This paper describes an application of behavior modification techniques and new means of presenting academic materials to the 450 children in the kindergarten and first grade of a small semi-urban community. Four years of research on behaviors useful in educational diagnosis and prediction of future success revealed two tests highly related to the achievement goals of the first grade; these are knowledge of vocabular and visuoperceptual memory. Screening is the program's first phase: the second is establishment of intervention strategies with regard to children diagnosed as highly susceptible to academic failure. The lowest children were initially treated individually by paraprofessionals trained to be instructional aides. Academic materials were often presented in a gamelike format to provide continuing reinforcement of learning. Techniques with a lower cost per pupil were selected for learning enhancement at other levels. These included cassette programming, the training of individual classroom teachers in behavior modification, the modification of the curriculum format, and the active involvement of parents in their children's education. (JM)

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A COMPREHENSIVE EARLY INTERVENTION PROGRAM EMPLOYING BEHAVIOR MODIFICATION TECHNIQUES

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Persons in government and education are beginning to realize that no growth stock has a higher multiple than the person who is successfully educated (Allen, 1970; Schewebel, 1968). Yet the problems of unsuccessful education continue to command the attention of large numbers of educators directly involved in public education, and there are countless professionals outside of education who earn a major part of their livelihood attending to the byproducts of unsuccessful school programs. Putting the costs of restorative techniques into the balance, an overwhelming mandate is generated for achieving greater success in the public schools. If one accepts the mandate to improve public education and works with the goals of effectiveness and efficiency in mind, certain conclusions seem to follow naturally. Efforts must take place in the primary grades in as preventive a way as possible, and philosophies and procedures must be selected which achieve the greatest impact on the selected goals.

Although American education is yearly flooded with a broad spectrum of philosophical and technical nostrums, certain innovations seem to carry above average promise. One influence which cuts across the philosophical and technical realms is that of behavior modification. Although the techniques emerging from this general school of thought are quite varied, the philosophy is consistently one of putting the burden upon the educator for establishing effective conditions of learning. Thus learning failures automatically become a challenge and a mandate for seeking environmental modifications; failure to learn is an indictment of the public schools and not cause for examining the

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child for internal states which suggest inability to be educated.

In addition to the emphasis upon the early grades and the basic philosophy associated with behavior modification, this project emphasizes one further contribution to effective and efficient education. Although curriculum materials are one area where appropriate scientific examination has just begun, it is clear that the method of presenting academic material requires a great deal of improvement. We have incorporated in the project an effort to examine increasingly effective techniques for presenting academic materials to the children, whether in the form of additional persons other than the teacher, or modified software and new forms of machine presentation.

The setting of this project is a small semi-rural community, with about 250 children in each primary grade. The project concentrated initially in the first grade, but now attends to the approximately 450 children involved in kindergarten and first grade. A program designed to enhance learning in large numbers of children must contain ways of effectively defining target populations if every child cannot be involved in every phase. One aspect of this project has been the effort to better define learning potential in each child. Although the full dimensions of these efforts are beyond the scope of this report, the important facets are worthy of comment.

We have spent four years examining carefully the traditional ways of judging a child to be ready for school and searching for more effective ways of making accurate judgments. In brief, we were amazed at the poor information available regarding the value of many traditionally accepted guidelines. A major part of the confusion was due to lack of adequate investigation of various testing procedures employed. For example, we looked in vain for studies relating such IQ tests as the Stanford-Binet and Wechsler Intelligence Scale for Children to actual learning experiences. It seems since everybody knows the IQ is the best predictor of learning ability, nobody

bothered to check it out at this level! Studies appearing within only the past 2 years have sharply questioned the adequacy of these tests at the primary level (Dudek, 1968, Hirst, 1969, Severson, 1970), and a great deal of irrelevant "noise" has been found among the subtests.

What we have discovered is that it is a tedious process to discover the behaviors actually important for effective learning, and those behaviors which might be good predictors are not necessarily the best diagnostic tests. For example, knowledge of the alphabet is a good predictor of success in first grade, but Jay Samuels at the University of Minnesota has shown that teaching the children letter names does not improve their later achievement, whereas teaching letter sounds does (Samuels, 1970). It is a reflection of the well acknowledged dictum that what is correlative is not necessarily causative, even when common sense would seem to make it so.

Predicting poor learners

In the purely predictive area we have made some impressive gains. We have discovered two tests which are completely independent (knowledge of vocabulary, which is a "G" factor test, and visuoperceptual memory, which is highly related to storage of letter-like forms), yet both are highly related to the achievement goals of first grade. These rather brief tests allow us to identify quickly and with considerable accuracy those children requiring special help. They are not the only detection procedures we use, since information supplied by the parent and teacher are also of added value (Kaplan, 1970; Severson, 1970), but they permit much more powerful selection of the initial pool of vulnerable children.

Although screening techniques are an important phase, the next important aspect of an effective intervention program is establishing intervention strategies with regard to vulnerable children. This is not a simple issue, despite the plethora of simple answers available. One could emphasize the

importance of any of a number of deficient behaviors presumed to have importance, and then promulgate a treatment designed to eradicate this deficiency. Such a strategy is seldom sufficient, but is often perpetuated by the reversal of negative attitudes through enthusiastic promotion. This result is proof that the variance due to motivation is usually much more powerful than the variance due to skill differences. Give a child and a family hope that if they work hard they will succeed, and few of the behavioral or sensory deficits can hold them back. We do not wish to eliminate such professional enthusiasm for selling unproven approaches if they actually work, but the truth has a way of exceeding techniques based on wishful thinking.

Realizing that simple techniques for picking the most important behavioral deficiencies and/or the best modifications are not easily available, we have proceeded cautiously. We think one basic distinction of value lies in the differentiation between <u>what is known</u> and <u>how one learns new material</u>. IQ tests confuse these two aspects, and thereby lose a great deal of utility. By giving children a curriculum pretest, we learn if they know content presumed to be important for mastering a given grade material, or if they actually know a large percentage of it already. Once we determine where they are in a general academic sequence, we present them with new material and observe how well they learn new material. Where both are deficient, we have a better definition of a mentally retarded child (at least for the time being). Where background experience and specific academic knowledge of low, but mastery of new learning is intact, we have a child where an IQ score would underrate his progress in that grade. By filling in specifics of what a child knows and how he approaches new learning situations we are helping to abandon the global terms such as minimal brain damage, mentally retarded, emotionally disturbed, and other similar global appendages of little real value. Ultimately we are seeking a diagnostic approach which is based on an input

throughput and output learning model, and which examines the child under different kinds of tasks, different levels of task difficulty, different degrees of sensory input, and various modifications of environmental reinforcement. This level of humanistic engineering will someday find us equipped to deliver effective person-environment diagnosis for each child--a diagnosis which leads to concrete directives for modifying the environment and not a vague label which leaves the clinician with great freedom to do just about whatever he wants without the need to prove effectiveness and only a vague idea of what actually worked when improvement is obtained. Of course, such efforts will always involve a degree of specificity, and it may be that only when we have sufficient knowledge of, and environmental compensations for, over a hundred personal variables and a great deal more ability patterns, will we achieve the degree of desired control according to current guidelines. Such control must, of course, be carried out in a framework of acceptable choice of goals. Individual differences and variability of behavior and environmental elements will always keep us modest about our power to turn children into our sought for end products, but we have a great deal to achieve before we run into the limitations, and I feel certain we will be able to work through our concern about control and manipulation, terms which now are so unsettling to so many. We must, however, insist on bringing humanists into the schools, in the same numbers as we now are introducing technicians.

Types of modifications employed

Once we identified a vulnerable population in kindergarten and first grade with group and individual tests, the lowest children were initially seen individually by paraprofessionals who were trained to be instructional aides. In employing such persons we sought to go beyond the logic that individual contact was superior to group classroom involvement, a logic we realized might not even be empirically true.

We have learned a great deal since our earliest optimistic efforts with regard to many of the problems involved in selecting, training and supervising paraprofessionals (Severson, 1969), as well as how to use them with greatest effectiveness. Our best paraprofessionals have been mothers of top students in the primary grades, or mothers of children who have been seen for academic problems and who were successfully remediated. Qualities which seem to be related to unsuccessful performance have to do with the presence of very opinionated ideas about what should be done with individual children, inability to emit high frequencies and intensities of social reinforcement, inability to understand the role of reinforcement, and inability to accept supervisory feedback without being grossly defensive. No relationships have yet been found between level of formal education, amount of previous experience in working with people, age, or other obvious surface variables.

Once having a good group of paraprofessionals (we currently have 12 for handling about 60 children from the total of 450 children), the next step is providing them with effective materials and procedures. The materials are of two kinds. The more intrinsically enjoyable are almost completely drawn from the rapidly increasing pool of academic materials with gamelike qualities, such as marketed by such companies as Milton Bradley, Kenworthy, Charles E. Merrill and Fearon, or materials made ourselves which combine enjoyment with academic content. The rest are materials more directly related to actual classroom exercises. Whenever possible we avoid using materials drawn from their actual classroom experiences on the grounds that such materials have often acquired emotional value of a negative sort through continuing exposure under conditions of partial failure. Materials are made a flexible as possible, for the purpose of varying the format frequently. Not only is novelty of presentation an important goal (as a way of maintaining attention), but small units of the curriculum are often sent with the child for purposes

of rehearsal between sessions, and increasingly complex mastery is required through combining small units into longer sequences. The last major kind of material involves games of negligible academic value but with highly reinforcing qualities.

The choice of a range of reinforcing outcomes is equally as important in this project as the choice of effective sequences of instruction. In fact, we view the task and reinforcement dichotomy as artificial and often as unproductive as the mind-body dichotomy--only in our historical manner of thinking do they retain real value. What we seek is the highest level of learning rate, and we blend task sequences and non-task reinforcing outcomes together in such a way as to achieve the best learning rates. For this reason we first exhaust the value of optimally arranged sequences of tasks (Premack principle; which puts least preferred tasks first and presents subsequent tasks as they reinforce the involvement and mastery of earlier tasks) (Premack, 1959), and then introduce reinforcing outcomes from a hierarchy of preferred reinforcers (according to the adults!) in order to increase learning rate.

Since there is a learned resistance (often expressed) to such tangibles as candy or money on the part of school personnel and parents, we have sought to explore actively the intervening range of non-academic reinforcers. In addition to the chance to get involved in games of various kinds, and the optimal use of social reinforcement, we have explored a range of tangible reinforcements available through the use of drawings on a sheet of paper. These consist of such things as writing down the new colors, words or sounds or other tasks learned by a child (and sending the completed sheet home), letting the child color in flowers until he earns a pot of gold, rising up steps until a final objective is achieved, completing sequences of filled in stars, and so on. We are convinced that the range of possible reinforcers has just begun to be explored in education, and that all persons from teachers to

parents to administrators need to be educated with regard to the true importance of this aspect of learning. We are quite willing to use such tangibles as various candies or small games which can be kept, but we realize that community education with regard to the value of tangibles is necessary. Such things as a Monopoly set provides a marvelous number of reinforcers for a child who values the earning of a complete set, but the parent and teacher must accept the logic and practicality of such a move. One of the major limitations of current approaches to special education is the overemphasis on missing skills and the low level understanding of the role of reinforcement. Where is the standardized test which assesses the child's reinforcement repertoire? Basic researchers are working on the discovery of general reinforcers for various ages and groups, and some persons are working on discovering techniques of identifying individual reinforcers, but we have just begun to probe these areas in any real extent. Whereas skills may be shown to achieve some sort of steady state, reinforcers probably shift with the winds, particularly since they seem to be more easily affected by events. The effects of fatigue in changing skill variables seem to be much less than the effects of satiation in affecting the reinforcement value of a piece of candy. The issue is, of course, very much open to debate and exploration. Perhaps the distinction between skill and motivation is as meaningless as that between mind and body. Let us explore.

Paraprofessionals were the major resource developed for children at the lower end of the achievement spectrum. The enhancement of all the children was the ultimate goal, but it was recognized that such expensive interventions as paraprofessionals could not be provided at all levels. Thus, techniques which enhanced learning at other levels were sought which might be provided at a lower cost per pupil. Various resources which had possibilities to enhance learning experience were systematically examined.

It was assumed that the more able children had excellent attentional skills and could extend the degree to which they functioned independently. Therefore, with these children we have been exploring the various ways in which instruction could be presented in an individual way without requiring expensive hardware. In addition to such well established hardware as the Language Master, we have begun to explore the use of small cassette recorders. Curriculum tapes have now been prepared to present approximately 30 minutes a day of the reading lessons, and we have learned that individual interaction with the cassettes is much more effective than small group listening stations. Whereas initially we prepared tapes with small segments of music and occasional jokes to enhance the reinforcing value, we find the better students are so rewarded by increasing the rate of mastery of material that no such injected reinforcement is required; in fact, the students asked that it be removed.

In addition to the cassette programming, we have begun to develop other low cost techniques based on a self-scoring format for enhancing the extent of individualized instruction. By working on the principle of extension of effective self-educating, rather than trying ambitious establishment of completely individualized curriculums, we have been able to achieve impressive gains in freeing up the time of the teacher to spend in other ways. All the teachers in the primary grade were offered a 3 credit course in behavior modification techniques for the classroom two years ago, and we have spent considerable amounts of time in familiarizing them with practical ways of introducing these procedures into everyday teaching. Although we find the highly receptive teachers make quick gains in adopting these procedures, without an external reinforcement system set up <u>for the teachers</u>, which combines a certain amount of critical feedback, these procedures are not rapidly introduced in a spontaneous way. Learning to think systematically in

terms of person-environment interactions, and asking continuous questions about the actual reinforcing value of various personal and environmental conditions, does not come easily to the average classroom teacher taught to think in terms of teaching the curriculum out of a teachers' manual and explaining failures as either due to ability deficits or other internal and inferred states (fatigue, laziness, emotional disturbance, brain damage, etc.). We have begun to explore the value of placing school psychologists inside each room as "classroom management consultants", and find the model to have decided appeal. These school psychologists spend one half day a week in the classroom charting teacher and pupil behaviors on very specific behaviors, such as the amount of time on academic task (TOT), and the specific patterns of teacher reaction to each of several target children. This is translated into graphic form and returned to the teacher. Stripped of value-laden terms, this feedback seems to have a considerably higher chance of cutting through teacher resistance than more verbal and less precise assessments of what the teacher does.

In addition to working with the individual classroom teacher, modifying of curriculum format, and involving paraprofessionals with the low children, we offer a service to parents. We give them information from our assessment as to relative strengths and weaknesses, and provide low cost materials and instructions as to how they can work with the child at home to enhance and extend the effectiveness of learning in the school setting. These efforts, similar to those of many other similar efforts, lead into several directions. We have tried to focus on areas of learning and refrain from deeper involvement with social and personal problems, although these needs become rapidly visible when contact is made. Although we experience the typical paradox of having the better educated and more highly motivated parents much more

eager for information and supplies, it is possible to get working mothers to spend increasing amounts of time with their children. Typically, we start out by showing them how they can change their reactions to the school behaviors of the child, how they can express an interest in the work at school without great investments of time, and then when interest develops, we provide them with information (via cassettes) and materials for spending time at home. Often the continuing work with the child is taken over by an older sib, but the mother is retained as a key link in supervising the home program. The paraprofessionals are gradually filling in the supervisory gap with regard to the parents, and once that contact is made the information flow spreads to other areas outside the school experiences.

In general, this project works on an escalator principle at all levels. Granting that it takes initiative and original knowledge to set it in motion, as we proceed we find untapped resources within the community. We are now in the process of training high school underachievers as tutors of children in lower grades (building on the suggestion of other programs), of upgrading people at one knowledge level into becoming able to perform higher level functions as teachers and supervisors of others without these skills, and of refining our procedures so they may be passed on to other communities. This year the paraprofessionals tested all the first graders in a contiguous community, which serves two purposes. It gives us better information as to what the exact nature of our impact is, and it helps them to obtain norms for their own detection and intervention program next year. Scores are not returned to them until after the completion of the year, and we will then invite them to our system for in-service instruction regarding details of the program. We ask each new system which benefits from our experience to take on the commitment of training a new community once they feel confident of the value

of their program. Consistent with these local objectives, we are in the process of developing a videotape and written manual in the area of early intervention in order to widen the area of dissemination. We also welcome visitors to the program, and mail out mimeo material upon request with details the specific training procedures used with the paraprofessionals and the kinds of detection instruments we have found to be of value.

Although "hard" findings regarding the worth of this program are just beginning to emerge (some of the data take three years to evaluate, such as assessment of children at time of spring pre-kindergarten "Roundup"), many impressions and some findings are already available. We have had individual children who tested formally in the retarded range, and who showed no positive response whatever to school, suddenly take root and learn to read sufficiently to remain within the regular classroom in the following year. Our own specific records of individual progress, based on very specific detailing of correct trials, are convincing evidence of the progress of many of the children, Since we are fully aware that many programs in the country are getting phenomenal gains also in individual children, we recognize that we have joined with a broad spectrum of school innovations which hold promise of reversing the currently dismal statistics of failure. What we consider unique in our program is the effort to spread the value of the program in a systematic way to neighboring communities, and to make the kind of information and help available so specific that persons are not at a loss as to why the program works. Drawing on the Laubach philosophy of "Each one teach one", we hope to build in the concept of the educational growth stock, with unknown ultimate benefits. If we can also sell, as part of the package, the need to make careful assessment of each technique, the need to look for continuously improved ways of doing the same thing, and the need to innovate

at a constant rate, we think the model can benefit a system much more than the current hit-or-miss attempts to innovate. If done slowly enough to avoid precipitating marked resistance against innovation, and if done carefully enough to convince most of the skeptics, then it is remarkable what considerable progress can be achieved even with minimal resources. If the principles of escalation and improvement are introduced along with the innovations, the results can become impressive indeed.